3.12 CLUTTER

Subroutine CLUTG in *RADGUNS* computes the power that the radar received from a ground clutter patch at the specified range, provided the radar beam intersects the earth's surface at that range. The earth is assumed to be a perfect sphere, covered with uniform ground clutter. At ranges within the horizon when the radar beam intersects the ground, some power returns to the radar receiver as a result of reflection by the earth. The intensity of this return is a function of range, the RCS of the ground clutter patch, and the angle between the radar beam center and the position vector of the ground clutter patch. Once these are known, the radar equation is used to calculate the clutter return power.

Data Items Required

Data Item		Accuracy	Sample Rate	Comments
2.2.1	Target altitude		10 Hz	Above ground level at radar
2.2.2	Clutter RCS/area		10 Hz	
2.2.3	Target RCS		10 Hz	
2.2.4	Detection range		SV/T	
2.2.5	Clutter Power		10 Hz	
2.2.6	Antenna elevation angle		0.1deg/step	
2.2.7	Antenna azimuth angle		0.1deg/step	
2.2.8	Target echo		10 Hz	
2.2.9	Receiver noise figure		SV/T	
2.2.12	Terrain cover	n/a	SV/T	
2.2.14	Clutter signal amplitude	-9 W	0.1 deg steps, 0 to 360 deg Az, 0 deg El, range gate step increment to horizon	

3.12.1 Objectives and Procedures

Detection ranges computed by *RADGUNS* are a function of target RCS and altitude above ground level (AGL), but are also sensitive to clutter returns under certain conditions. At low altitudes, where the radar beam grazes the terrain surface, and for targets with low RCS values, detection ranges are reduced in the presence of significant clutter returns.

The sensitivity analysis was aimed at determination of the boundary conditions for which test measurements of detection range would be affected by clutter and the resolutions of data items required to assess such effects. Sensitivity tests of *RADGUNS* were executed with the following parameters:

a. Model mode: SNGL/RADR
b. Target type: 0,
c. Flight path LINEAR
d. Radar type: RAD1
e. MTI: OFF
f. Guns: Disabled
g. Multipath: Disabled
h. Clutter type: NUME

i.	Target altitude:	50, 100, 150, 300 m
j.	Target offset:	150 m
k.	Target speed:	150 m/s
l.	Clutter RCS/Area:	0,
m.	Clutter RCS/Area variation:	0
n.	Output:	Detection range

3.12.2 Results

Figure 3.12-1 shows that as the clutter intensity increases, its effect on detection range approaches a burn-through limit of about 1500 m for all of the small RCS targets. Measurements of clutter can therefore be less accurate as the intensity of the clutter increases above dBsm/sm will reduce the detection range by only a few meters.

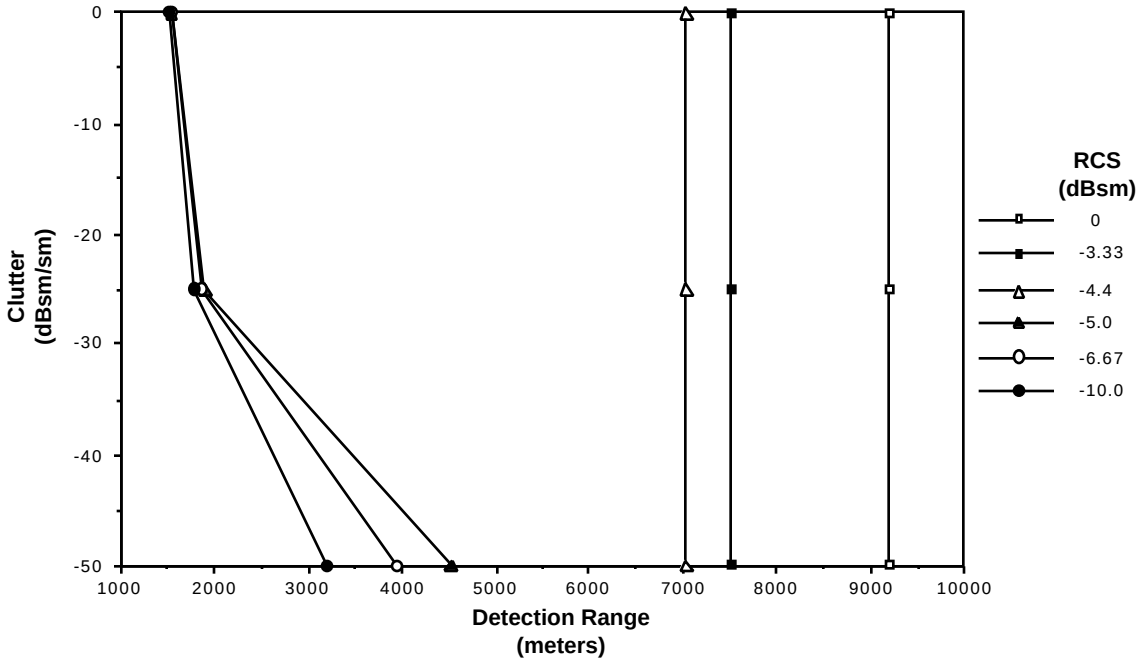

FIGURE 3.12-1. Detection Range vs. Clutter (Altitude = 50 m).

3.12.3 Conclusions

As clutter intensity decreases, accuracy of measurements become more critical as the effect on detection range also decreases.